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THE ORIGIN OF MAN.

Morphology and Anthropology. A Handbook for Students. By W. L. H. Duckworth, M.A. Pp. xxvii + 546. (Cambridge: University Press, 1904.) Price 15s. net.

Studies from the Anthropological Laboratory, the Anatomy School, Cambridge. By W. L. H. Duckworth, M.A. Pp. x + 291. (Cambridge: University Press, 1904.) Price 10s. net.

THE publication of Mr. Duckworth's text-book for students, bearing on its title page the rather vague terms, "Morphology and Anthropology," marks the culmination of the remarkable movement initiated by the publication of Huxley's "Man's Place in Nature" in 1863, and quickened in 1871 by the appearance of Darwin's "Descent of Man." At the commencement of this movement the subject of man's origin had its abode in the divinity schools; it was taught by theologians; the opening chapters of Genesis constituted the accepted text-book; now, in 1905, the subject is assigned to the anthropological laboratory; the lecturer on physical anthropology is its custodian, and the text-book is the work now under review.

In a clearly written introductory chapter Mr. Duckworth defines the subject-matter of his book as an inquiry into (1) man's zoological position; (2) the nature of his ancestry. That such a work is needed there can be no doubt. Ever since Darwin and Huxley gave this subject a legitimate place in the hands of biologists, experts have been busy as ants, seeking, collecting, and storing facts in the tome upon tome that annually come to crowd our bookshelves. The embryological history of man, anthropoid and ape have become known; important additions have been made to the geological record; our knowledge of the structure of the Primates has increased twenty-fold; all the additional evidence of thirty years thus lay at Mr. Duckworth's disposal awaiting systematisation. He has every qualification for the task; he has devoted many years to examining and extending the evidence on which our conception of man's origin rests. "Studies from the Anthropological Laboratory," the second work included in this review, containing thirty-six papers dealing with various aspects of primatology, guarantee his industry and first-hand knowledge. He has the advantage, too, of having at his disposal the great anthropological collections accumulated by Prof. Macalister, and free access to one of the best libraries of the world.

It is natural to expect that Mr. Duckworth, having so much additional evidence at his command, is able to define man's position in the animal kingdom with a greater degree of precision than was possible at the time when Huxley and Darwin wrote. Huxley, it will be remembered, restored man to the position originally assigned to him by Linnæus, namely, that of a family in the order of Primates,

because, on the evidence he was able to adduce, man differed less in point of structure from the family of anthropoids than the anthropoids from the family of the Old World monkeys. Further, Huxley regarded the chimpanzee and gorilla as the animal forms most nearly related to man. In these two respects Darwin agreed with Huxley. In the classification adopted by Mr. Duckworth, man retains the position assigned to him by Huxley. Mr. Duckworth's style in producing evidence and conflicting theories is open, frank, and impartial, but in setting forth his conclusions he is so eminently non-committal that it is difficult to cite a passage which concisely expresses his conception of the exact position which man holds with regard to other families of Primates. On p. 226 the following passage occurs:—

"But no single example among the larger Simiidæ can be pointed out with confidence, as embodying the characters of the human ancestor at the simian stage of evolution more completely than any other, though there is a slight margin of evidence in favour of the Chimpanzee, rather than the Gorilla or the Orang-utan."

Thus it will be seen that the matter of man's zoological position remains where Huxley left it. Huxley had an incomparable faculty of drawing just conclusions from limited data, but few men who are experts on this matter will agree that Mr. Duckworth has utilised the evidence at his disposal to the fullest extent possible.

Nor has the evidence which has accumulated in the last thirty-three years permitted Mr. Duckworth to make a more definite statement as to the ancestral chain or phylogenetic path of man than was made by Darwin in his first edition of the "Descent of Man" in 1871.

"The Simiadæ," wrote Darwin, "then branched into two great stems, the New World and Old World Monkeys; from the latter, at a remote period, Man the Wonder and Glory of the Universe proceeded" (vol. i., p. 213, 1st ed.).

Mr. Duckworth's conclusions in this matter are summed up at p. 542 as follows:—

"But while it is shown that the Hominidæ have in their evolution passed through a stage which is better reproduced by the Simiidæ (anthropoids) than by any other of the Primates, it is practically certain that the modern Simiidæ did not themselves figure in the ancestry of man and that they are themselves specialised in a high degree, more specialised in many ways than the Hominidæ and more specialised than their own ancestors. As Klaatsch puts it, the ancestors of the modern Simiidæ were more anthropoid than the actual Simiidæ, just as the ancestor of the Hominidæ was more pithecid than modern Man. And the balance of evidence indicates that the line of human ancestry would, were the material still available, be traceable down to the lowest Primates (Lemuroidea) and even to the lowest Mammals. Moreover, it is undeniable that the Hominidæ have retained in hand and foot some features of an early ancestor, from which they have departed less in type than have the (modern) Cercopithecidae and Simiidæ. But detailed information on these points is still lacking."

Leaving out of account the oracular statement quoted from Klaatsch, there can be no question that Mr. Duckworth's inference as to man's line of ancestors is much less definite than that of Darwin, and certainly, in the opinion of many well qualified to judge, less in keeping with the evidence at our disposal. What the peculiar primitive characters of the human hand and foot may be the writer cannot guess, but it is certain that there are numerous characters in the human hand and foot which can be accounted for only on the supposition that at one time they were used functionally as are now the hands and feet of anthropoids. Mr. Duckworth states his opinion guardedly, but it is evident from the statement just quoted that he believes the line of ancestors that connect modern man with a primitive lemuroid (Eocene) stock is extinct and unknown, and that this line of ancestry runs an independent and parallel course to the ancestral stock of the anthropoids. Now man shares with the chimpanzee and gorilla some three hundred structural features which are not possessed by any lemuroid form of which we have any knowledge, nor can the common possession of these characters be accounted for except on the supposition that man and these two anthropoids are derived from a common stock. A full investigation of the evidence will show that Darwin was not far from the truth when he supposed that the gorilla, the chimpanzee, and man have their origin from a common stock. Modern man differs from the Miocene anthropoid *Dryopithecus* in structure no more than does the modern horse from its Miocene ancestor. In *Dryopithecus*, characters are recognisable which link it with the gibbon on the one hand and the chimpanzee on the other. *Palaeopithecus*, a Pliocene anthropoid, in the characters of its teeth and jaw, which are the only parts yet found, links the chimpanzee to the orang. The modern gibbon differs in an incredibly small degree from its Miocene ancestor, and shares many characters in common with the great anthropoids, man, the Old World monkeys, and New World monkeys, and is by far the most generalised form of higher Primate now extant, in spite of many adaptive features. In short, the evidence points to the common origin of man and the great anthropoids from a gibbon (Hylobatian) stock; this in turn, with monkeys, must be traced to a lemuroid origin.

Mr. Duckworth deals very justly with the evidence yielded by embryological investigation. Thirty years ago, when it was believed that the embryo recapitulated its ancestral stages *in utero*, it was thought that the history of man could be written when his development became known. "Palaeontology is good but Embryology is better," wrote Kitchen Parker, but now we know, and Mr. Duckworth states the case fully, that the embryological phases are so obscure that they can only be construed by the help of comparative anatomy and palaeontology. It has come to be recognised that every mammal is adapted to two separate lives—an intra-uterine life and an independent life; the features of the one

existence mask those of the other. Yet Mr. Duckworth makes the important fact stand out that the intra-uterine life of man is exactly similar, so far as we yet know, to that of the anthropoids, and in that, while it resembles in most points the lower Primates, yet differs from all other mammals.

It must be admitted that Mr. Duckworth's task was not an easy one; yet no essential or important contribution has been passed unnoticed by him. His statements are clear and impartial; he has even a kindly word to say for some notions, such as the temporary fissures of the brain, which most anatomists, in common with himself, now regard as *post-mortem* artefacts. In another edition, which this work is certain to attain, the statements made in the following sentence (p. 201) will require some amendment:—

"Selenka thus regards the syncytium (a peculiar tissue) as derived neither from the chorion-entoderm (Kollmann), nor from the submucous uterine decidual connective tissue cells (Minot, 'Human Embryology,' pp. 13 and 375) nor from the foetal ectoderm (Robinson, 'Hunterian Lectures,' *Journal of Anatomy and Physiology*, vol. xxxviii. p. 493), but from the epithelial lining of the uterus."

Mr. Duckworth unwittingly does the late Prof. Selenka a double injustice; in the first place he reproduces an acknowledged modification (Fig. 148, p. 203) of a figure by Selenka, in which the syncytium is made to appear as a continuation of the lining epithelium of the uterus, whereas in Selenka's figure it is clearly shown not to be continuous; secondly, Selenka ("Studien ueber Entwicklungsgeschichte," Heft viii., pp. 190, 193) expressly states that he is uncertain of the origin of the syncytium, but that the evidence is rather in favour of its origin from the cells of the uterine glands. Expert opinion regards it as settled that the syncytium does not so arise, but springs from the ectoderm of the embryo, a conclusion which seemed to Selenka not improbable. He does Kollmann also an injustice, for in his text-book (p. 201) that author expressly states that it arises from the lining epithelium of the uterus—the opinion ascribed by Mr. Duckworth to Selenka. Nor will Minot acknowledge the opinion ascribed to him, for on p. 322 of a text-book on human embryology he states that he is convinced that the syncytium is derived from the embryonic (chorionic) ectoderm, the opinion here ascribed to Prof. Robinson. Nor will Prof. Robinson be willing to accept priority for the theory of the ectodermal origin of the syncytium; probably Hubrecht has the greatest claim to be accounted the pioneer in this matter.

It would not be just to close this review without acknowledging the number of original facts and fresh opinions that mark the pages of this work. The opening chapters are perhaps too condensed; the long lists of characters enumerated are rather apt to lead to mental dyspepsia even in the pages of a text-book, and one misses a statement of their functional meaning, which would greatly assist the memory in ranking them together. The chapters on

the cerebral organisation are specially well done, and contain the best exposition yet published of our knowledge of that part of the Primate organisation. Special prominence is deservedly given to the brilliant work of Prof. Elliot Smith. There can be no doubt, too, that this work will lead to a renewed vigour in the search for evidence bearing on the origin and relationships of the higher Primates.

A. K.

CHEMISTRY FOR YOUTHS: MRS. MARCET REDEVIVA.

Die Schule der Chemie. By W. Ostwald. Zweiter Teil—Die Chemie der Wichtigsten Elemente und Verbindungen. Pp. viii + 292. (Brunswick : Vieweg and Son.) Price 7·20 marks.

ABOUT a year ago, the first volume of Prof. Ostwald's dialogues on chemistry was noticed in these columns. We have now the second volume, written in as lively a strain as the first, and conveying the author's views, which bid fair to become in the main everybody else's views, as regards the presentation of the elementary facts of chemistry. It would be wrong to say that in this volume, consisting of 292 pages, there is more system; but in it we come to a discussion of chemical facts and theories which are generally treated in school text-books. The pupil is introduced to chlorine, its preparation and properties; its behaviour with water; acids and bases, and elements; combining weights, and multiple proportions; the atomic hypothesis, and the laws of volume combination; electrolysis and salts. Chlorine is again considered as regards its compounds with oxygen, and then follow bromine and iodine; sulphur and its compounds; nitrogen, ammonia, phosphorus, and so on through the commoner elements and their compounds.

Throughout the volume we find neat remarks which sustain interest, at least, when it is glanced through, for I do not think that anyone who is already a chemist will read the volume as carefully as he may have read the first volume. For example, on the first page is an aphorism, too often neglected, but none the less true:—"When much has been learnt, time must be given for digestion." In English "cramming doesn't pay in the long run."

Everyone knows that Prof. Ostwald does not hold by the atomic theory. Yet he does not escape from it. His presentation of it is, however, ingenious, as indeed are all his methods. Discussing the facts of multiple proportion he gives the following illustration:—

"Think of a collection of coins, where German marks, English shillings, French francs, Russian roubles, and other coins are to be found. You can combine these coins in twos and threes; each combination, however, has the value of the sum of the individual value of the coins, and you cannot obtain any other values, combine them as you will. Similarly, no other compounds can be formed but those obtained by bringing the elements together according to their combining weights."

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The pupil then draws the required conclusion:—

"That is as if each element consisted only of equal pieces, just as all francs or marks are equal among themselves." "Yes," answers the teacher; "that is the picture which has represented the state of affairs to men's minds for long. It is supposed that each element consists of minute particles, named atoms," and so on. When the boy asks, "Is all this true?" the teacher replies, "No one has seen an atom, nor weighed one. This is therefore a hypothesis, but a very convenient one, because the various applications of the laws of combining proportions can be better realised (merken) when the picture of atoms is simple and clear." "But we can do without it!" says the pupil. "Certainly," says the teacher. "But just as you found it easier to count on your fingers than in your head, so it is easier to think of atoms, than of the abstract and general laws of combination." So we have to teach by means of atoms. Indeed, few of us would go further, especially in these later days, when even atoms are failing us. The hypothesis is, however, ignored a little later, when it is stated that "the rule has been made never to write fractional parts of combining weights." The doctrine of the indivisibility of atoms would appeal more readily to a young mind. Yet in fairness, it must be acknowledged that the writer makes the pupil suggest that each chemical symbol stands for an atom, and acknowledges, in the mouth of the teacher, that "the atomic theory can be easily grasped" ("etwas sehr eingängliches hat").

When electrolysis is discussed, the author's ingenuity in devising analogies is at its best. The pupil has difficulty in picturing a positive and a negative current going in opposite directions through the same wire. He is reminded of waves crossing each other in a pond, and of the upper and under parts of a driving-belt travelling in opposite directions.

Heats of combustion, discussed under the heading "carbon," are measured in kilojoules, instead of calories. This is perhaps logical, but it appears to the reviewer that the older unit might have been retained until a later stage. It is easy to make the reduction when required; and it is easier to realise heat as heat than as work, at first, at least.

While acknowledging that the subject of chemistry is here well treated, and that the author has maintained his lively style and faculty of lucid presentation, it may be questioned whether this method of discussing chemistry should have precedence over the ordinary text-book. A youth who advances so far as to grasp the contents of volume I., will, I think, tire of the plan of question and answer. Yet perhaps there are some who prefer to take their food, as they do medicine, in spoonfuls, and to whom the form of dialogue has its attractions. In old days "Pleasant Pages" was widely read, and no doubt conveyed valuable lessons. And at any rate, teachers of chemistry may learn much from this volume in hints as to how best to present the very numerous facts of the science to their students, whose digestive powers are as a rule limited.

W. R.